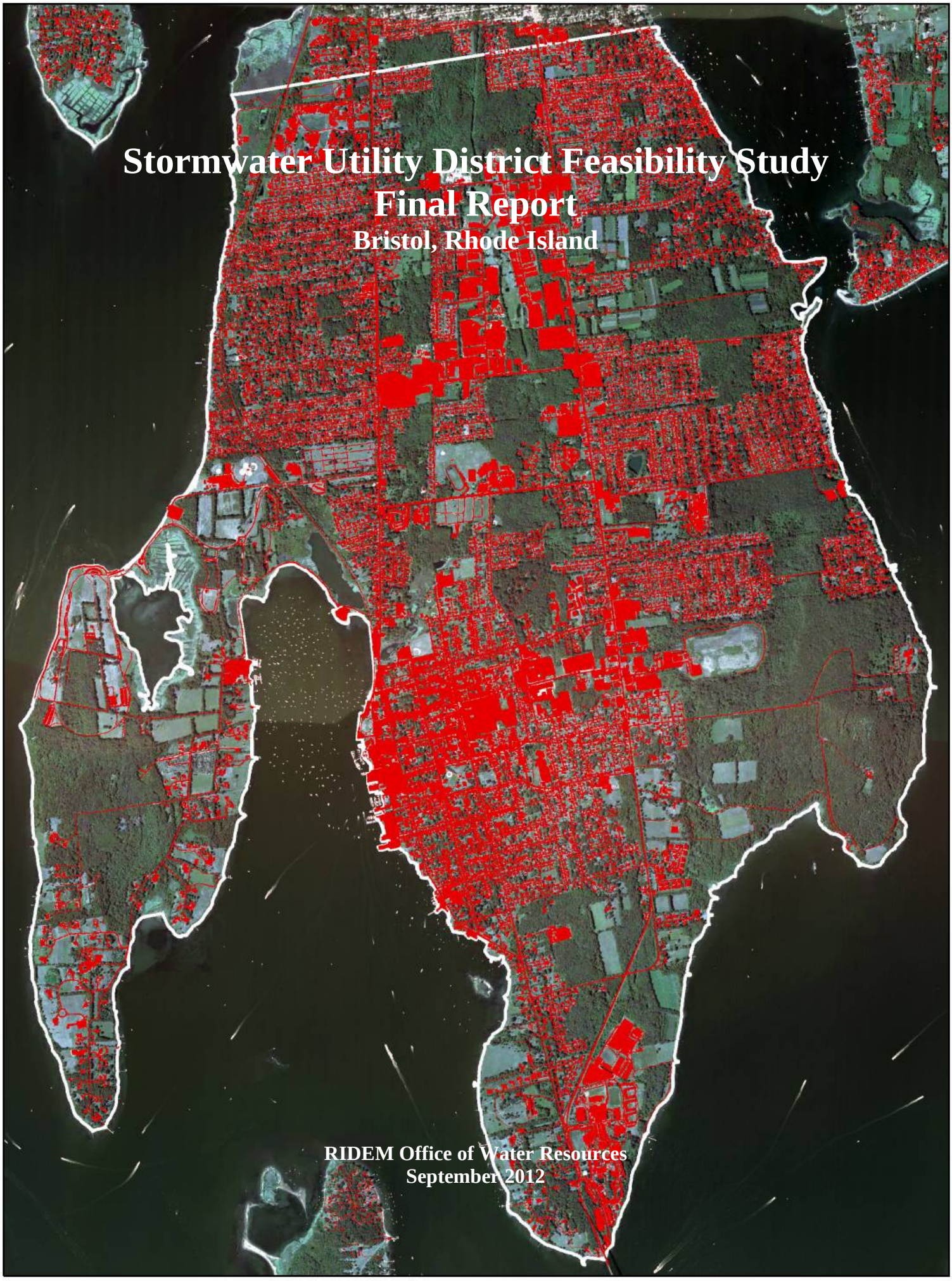

Stormwater Utility District Feasibility Study
Final Report
Bristol, Rhode Island

RIDEM Office of Water Resources
September 2012

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Acknowledgements

This report was researched, written and assembled by Kate England, Seasonal Technical Support Intern, RIDEM, with contributions made by Elizabeth Scott, Deputy Chief of RIDEM's Office of Water Resources, Edward Tanner, Bristol Principal Planner/Zoning Officer, Diane Williamson, Bristol Director of Community Development, James Galuska, Bristol Director of Public Works, and Julie Goucher, Bristol Treasurer.

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1.0 Introduction

This report is intended to provide information to the Bristol Town Council and Town Administrator in order to consider adoption of a stormwater utility as a potential funding mechanism for the Town's stormwater management program. In doing so, it is important to define stormwater program needs, the factors driving the need for enhanced stormwater management as well as the available funding options. Since this report focuses on the feasibility of a stormwater utility for funding Bristol's stormwater program, the concept is first defined below. Definitions of terms used in the document are provided in Appendix A of the document.

What is a Stormwater Utility?

A stormwater utility is primarily a revenue generating program that allows municipalities to better manage stormwater by creating a designated fund for stormwater management. Like a water or sewer utility, a stormwater utility generates revenue through user fees that are based upon the amount of stormwater generated on a property. These fees are assessed by measuring the amount of impervious cover within a parcel, are determined by the financial needs of the municipality and can be adjusted over time to continually meet those needs.

Stormwater utilities are also drivers for physical change when they include a well managed credit system. A credit system provides the opportunity for property owners to reduce their fee by disconnecting or reducing impervious cover and managing stormwater on-site.

A stormwater utility provides a vehicle for:

- Consolidating or coordinating responsibilities that were previously dispersed among several departments and divisions;
- Generating funding that is adequate, stable, equitable and dedicated solely to managing stormwater; and
- Developing programs that are comprehensive, cohesive and consistent year-to-year

2.0 Background

This section discuses background information related to stormwater and regulatory requirements to address water quality issues. This information is intended to provide the framework for evaluating a stormwater utility as a potential mechanism to fund a clearly defined stormwater management program for the Town of Bristol.

2.1 Stormwater & Water Quality

Land development has a profound influence on the quality and quantity of the state's waters. Every time it rains, the rainwater that is not absorbed into the ground or evaporated (called runoff) carries contaminants from lawns, streets, buildings and parking lots and deposits them directly into our rivers, lakes, ponds, and the Bay. Stormwater causes beach closures, contamination of shellfish beds, nuisance conditions in lakes, and degraded aquatic ecosystems. In Bristol, stormwater contributes to the closure of shellfishing waters in the Kickemuit River and Mt. Hope Bay, both of which are considered impaired in the state's Integrated Water Quality Monitoring and Assessment Report (which includes the 303d list of impaired waters). Untreated stormwater is also thought responsible for beach closures at the Bristol Town Beach. The lack of

adequate drainage structures in certain areas of town has also contributed to the inflow of non-sewage flows into Bristol's sewer lines causing sanitary sewer overflows, the subject of a 2007 compliance order by US EPA.

Because most rainwater is no longer absorbed into the ground, land development also influences the hydrologic cycle. The changes begin during construction when trees are removed, natural depressions are graded to a uniform slope, and native soils are scraped off, eroded or compacted. After construction, rooftops, roads, and parking lots further prevent the infiltration of rainwater. If the increased volume and velocity of stormwater is not managed, stream channels become undercut and widened, and downstream flooding can occur.

2.2 Stormwater Management Requirements

Consistent with federal regulations, DEM requires most RI municipalities and selected industrial activities to obtain a Rhode Island Pollution Discharge Elimination System (RIPDES) General Permit (also known as a Phase II stormwater permit) to establish programs to protect the quality of surface waters by controlling pollution from stormwater discharges. Program elements include: public education and involvement programs; controls on stormwater runoff from new development both during and after construction; ongoing detection and elimination of illicit discharges into the storm sewer system; and pollution prevention programs such as catch basin cleaning and street sweeping – collectively referred to as the "six minimum measures". Additionally, as a result of water quality restoration studies referred to as TMDLs (Total Maximum Daily Load), owners of storm sewer systems may be required to enhance their six minimum measures to improve pollution prevention and/or to undertake and implement catchment area analyses to identify locations where structural retrofits can be constructed to reduce stormwater pollution (and runoff volumes).

Additionally, effective January 1, 2011 new land development and certain redevelopment projects must follow the recently revised RI Stormwater Design and Installation Standards Manual which requires the use of low impact development (LID) techniques as the primary method of stormwater control. The manual also requires infiltration of a portion of stormwater into the ground and includes water quality performance standards that stormwater management practices must meet to minimize impacts to surface water and groundwater.

2.3 Current Stormwater Funding Approach

Stormwater management is typically funded by general fund revenues and for many municipalities, constrained budgets have translated into insufficient funds to properly maintain and operate drainage systems. At present, Bristol's stormwater management program is funded primarily by Department of Public Works funding designated from Bristol's General Fund and money from town bond proceeds. Working with the Town's Drainage Committee, formed in response to town-wide drainage and flooding problems, the Town continues to spend down the $3 million bond approved by Bristol voters in 2006 to pay for drainage improvement projects. With these bond funds, Bristol has been able to make headway in addressing flooding and other drainage problems in the Tanyard Brook and Silver Creek areas of town. In recent years, the

Town has also received limited federal grant funds (Section 319) and a State Revolving Fund low interest loan to finance the design and construction of stormwater treatment structures to mitigate polluted runoff from town roads and the beach parking lot which discharge onto the town beach and contribute to beach closures. Using sewer enterprise funds, the Town's drainage system has been mapped as part of efforts to address the significant problems posed by inflow and infiltration into the sewer system.

As evidenced by these examples, Bristol has been able to successfully leverage town general revenue funds with federal stimulus dollars, road and drainage bonds, grants, and private funds to move forward a number of high priority capital improvement projects. However, there is much more to be done including drainage improvements needed to address flooding and water quality concerns (including the separate sewer overflow problem) and to proactively repair or replace aging and deteriorating drainage structures. A more stable revenue stream is needed for the Town to manage operation and maintenance of Bristol's drainage system in a planned and systematic manner and to fully comply with its Phase II Stormwater Permit requirements.

An increasing number of municipalities across the nation are opting to adopt stormwater utilities as a means of establishing a more stable and predictable funding source. By systematically managing runoff and reducing pollutants entering the environment, they are striving to avoid the potentially high costs of flood damage, potential litigation and/or regulatory fines, and to prevent loss of property value.

2.4 Benefits of a Stormwater Utility

A stormwater utility is a public utility established to provide stormwater management services. Today, there are over 2,000 stormwater utilities nationwide that either partially or completely fund municipal stormwater services. An important distinction between stormwater utility fees and real estate taxes is that they are user based and are tied to stormwater management services provided by the utility, whereas taxes are not tied to specific services. For example, the owner of a large business with acres of impervious pavement and more use of or impact to the stormwater system would pay more than the owner of a single-family residential parcel. Essentially, "the more you pave, the more you pay."

The key rationales for establishing a stormwater utility are:

- **It is Stable** – it is not as dependent on the vagaries of the annual budget process as taxes are.
- **It is Adequate** – the fee is based on a well thought out stormwater program to meet the needs and demands of the community.
- **It is Flexible** – it can adapt to changing program and funding needs over time.
- **It is Equitable** – the cost is borne by the user on the basis of demand placed on the drainage system (and receiving waters).

<u>Other Benefits</u>:

- Utilities can be made geographically specific

- Funds raised by the utility to manage stormwater are no longer needed from the General Fund
- Tax exempt properties that do not contribute to the General Fund pay towards the town's costs of managing stormwater under a utility
- Credits encourage positive change, including implementation of LID designs
- Transparency & accountability in that budget is related to services provided

Stormwater programs usually incorporate both stormwater quality and quantity aspects. Funds collected under a stormwater utility can be used for:

- Administration and operation of the district
- Operation and maintenance of existing structures
- Retrofitting of existing structures to improve water quality and alleviate downstream flooding or erosion
- Preparation of stormwater management plans

2.5 Stormwater Utility Enabling Legislation

In 2002, the state of Rhode Island passed enabling legislation, titled "Rhode Island Stormwater Management and Utility District Act of 2002," that authorizes cities and towns to adopt ordinances creating stormwater utilities. Stormwater Utility Districts may include all or part of a city or town, as specified by the ordinance, but state property is explicitly exempt from being assessed a fee. In January of 2011, Public Law 111-378 was passed stating that Federal properties may not be exempt from stormwater utilities. This law could be applied to any properties owned by the federal government (i.e. military, U.S. Post Office, etc.) within the utility.

Another aspect worth mentioning about the enabling legislation is the broad use of the term "system." The legislation states, "each contributor of runoff to the system shall pay to the extent to which runoff is contributed." There are many factors to consider when developing a stormwater utility district including the geographic extent of the utility (for example, whether town-wide or even multi-town), whether certain properties might be exempt from the user fee, and whether credits will be granted for property owners that retain and treat runoff on-site. Since "system" is not explicitly defined in the enabling legislation, municipalities are encouraged to include a clear definition for "system" in the ordinance to avoid ambiguity.

A copy of the enabling legislation is provided in Appendix B.

3.0 Compelling Case for Enhanced Stormwater Management

There are a number of drivers and compelling arguments that support the need for an enhanced stormwater management program in Bristol. It is important for municipalities to identify areas of the current program in need of change and to effectively convey that need to the public. When considering a stormwater utility, it is the stormwater program that drives the funding need and therefore the utility fee.

The following subsections outline drivers identified by the Town of Bristol that have prompted exploration into a more sustainable source of funding to meet increased stormwater management

needs and compelling arguments for why a stormwater utility may make the most sense to fund the current and future stormwater program needs.

3.1 Drivers for Change

The following drivers for a more robust stormwater management program were identified:

- Resolution of the town's sanitary sewer overflow (SSOs) problems requires stormwater drainage infrastructure to be properly operating and maintained so that as sump pumps are removed and other stormwater inflow and infiltration (I & I) into town sewers is eliminated, new problems with ponding and flooding are not created. In some cases, new drainage structures are necessary to accept sump pump discharges and otherwise resolve areas with chronic flooding and/or inadequate drainage
- Resolution of Anawamscutt (the Narrows) flooding and water quality issues
  - Construct needed drainage infrastructure to eliminate flooding and problems causing wet basements
    - Drainage study currently being completed
  - Investigate and as necessary mitigate bacteria sources identified by DEM and reported in the Mt Hope Bay/Kickemuit River Bacteria TMDL
- Elimination of Tanyard Brook flooding
  - Town has made considerable progress in addressing chronic flooding problems caused by the now undersized stone lined channel including the installation of a tide gate at the outfall to prevent flooding caused by high tides, and repair of lower half a mile of channel to increase capacity as part of Phase I
  - As part of Phase II, town will repair/replace additional portions of the existing culvert and investigate whether the State Street Reservoir, located at the headwater of Tanyard Brook, can provide greater flood control
    - Additional funding needed to restore the reservoir – enlarge the reservoir and fix the weir to optimize reservoir storage capacity of peak flows
- Elimination of chronic flooding and bacteria contamination of Silver Creek
  - Chronic flooding in various areas of watershed have caused road closures, disrupted traffic flow and caused damage to public and private property
  - Work by RIDOT to install snouts to prevent tidal inflow has reduced chronic flooding along Hope Street from six or seven times a year to two or three times a year
  - Town has slip-lined pipes and installed rip-rap and other infrastructure to eliminate flooding at Chestnut Street and in St. Mary's Cemetery which during the March 2010 flood caused tombstones to be upturned
  - Water quality monitoring at four stations on Silver Creek by Save Bristol Harbor volunteers has identified continual elevated bacteria levels
    - Additional monitoring in the East branch of Silver Creek is needed to find the bacteria source(s) contributing to the elevated fecal numbers
    - Follow-up needed to review outfalls that Town outfall sampling and monitoring program has identified as a problem
- Evaluation of BMPs constructed to eliminate wet weather closures at the Town Beach
  - Historically the beach was plagued with wet weather closures due in part to untreated runoff from a 36" storm drain discharging into a phragmites marsh at the north end of beach and also from runoff from the beach parking lot and nearby playing fields

        - Using 319 grant funds and SRF loan, Town re-paved the parking lot at the beach and constructed a series of bioretention trenches to infiltrate stormwater. BMP has been in operation since Spring of 2011 resulting in a notable decrease in beach closures
        - Town has successfully competed for upwards of $250,000 in federal 319 grant funds administered by RIDEM to design and construct a gravel wet vegetated treatment system to treat the first flush of runoff from the 36" storm drain that discharges to the phragmites marsh (expected to be completed in late summer 2012
- Continuation of necessary operation and maintenance actions to comply with Federal and State mandates to manage stormwater in accordance with Phase II stormwater permit requirements administered town-wide. The town struggles to complete all necessary operation and maintenance activities required by permit with current staffing levels including:
    - Annual inspection and as necessary cleaning of all catch basins
    - Two (2) Dry Weather Surveys of town owned outfalls and reporting of results to DEM
    - Timely preparation of annual reports
    - As part of site plan review process, construction site inspections of stormwater drainage systems and treatment structures (also known as Best Management Practices) to ensure that they are installed and constructed consistent with approved designs and the revised RI Stormwater Design and Installation Standards Manual adopted January 2011.
- Implementation of Phase II TMDL requirements to restore full shellfishing use in Mt. Hope Bay/Kickemuit River
    - Water quality restoration study (TMDL) identified five priority sources contributing to bacteria pollution causing shellfish closures. TMDL requires further investigation by the Town and possibly the elimination of illegal discharges into town owned storm drains and/or construction of stormwater treatment structures
    - Sources include two streams and two culverts that discharge to Mount Hope Bay near Bristol Landing Condominiums, the RIDEM Boat Launch south of Annawamscutt Drive, Viking Drive and Annawamscutt Drive. Another priority stream discharges to the Kickemuit River near its mouth
        - With the exception of the Annawamscutt culvert, all of the priority outfalls were characterized by high coliphage concentrations during wet weather possibly indicating the presence of sewer overflows, leaking sewer systems, cross-connections or perhaps failing septic systems
        - Although the Annawamscutt outfall had extremely low coliphage levels, it had the highest dry and wet-weather bacteria concentrations of any of the priority outfalls located in the Town of Bristol
    - Future operational and capital projects to address Phase II TMDL requirements aimed at restoring water quality and shellfishing use in the Kickemuit River and Mt. Hope Bay:
        - Prepare TMDL Implementation Plan amending town's Stormwater Management Program Plan to address TMDL provisions including measurable goals for the development and/or implementation of the six minimum measures and for additional structural and non-structural BMPs necessary to address stormwater control provisions in TMDL
        - Prioritize illicit discharge detection and elimination efforts to catchments with outfalls that discharge to Kickemuit River and Mt. Hope Bay and resolution of any problems caused by inadequate sewage disposal

        - Revise ordinance(s) controlling post construction stormwater to prevent any increase in bacteria loads from new development and to reduce bacteria loads from re-development sites
        - Once problems associated with inadequate sewage disposal are resolved, the Town must sample affected storm drains to confirm that these outfalls are no longer significant sources of bacteria. If it is determined that elevated bacteria levels persist, the Town is expected to undertake actions to abate the stormwater related bacteria loads from these priority outfalls
        - As relevant, a feasibility study must be conducted to determine the types and locations of BMPs that will be most effective in reducing stormwater volumes and bacteria loading to the bay and river to the maximum extent feasible
        - The drainage system(s) contributing to any priority streams should be evaluated for possible BMP construction
        - Design and construction of structural retrofits beginning with TMDL identified priority outfalls
- Timely completion of ongoing town-wide projects
    - Stormwater drainage repairs and upgrades to address chronic flooding problems (standing water, puddling and sinkholes) which create public safety concerns associated with the diversion of public safety vehicles as well as driving hazards for general public
        - Repair of St Mary's Cemetery outfall recently completed, other projects that are underway or pending:
            - North side of Chestnut Street – spillway at the High School
            - Sherry Avenue – clogged or damaged culvers cause icing problems
            - Peck Avenue – needs drainage infrastructure
            - Elmwood Drive – BMP needed to address flooding
    - Infrastructure repairs to address damage caused by flooding
    - Repair or replacement of aged, deteriorated and/or undersized storm drainage systems, including broken and clogged outfalls
    - Ongoing maintenance of detention basins that need to be mowed and cut
- Need for new equipment to resolve inadequacies of existing equipment (new miniature excavator purchased [$35,000] in June)

3.2 Building a Compelling Case

In every community there are good, even compelling, reasons to improve the way stormwater programs are executed and funded. Reasons might be a popular stream that is becoming increasingly impacted, a lack of riparian park space, decaying drainage infrastructure and mounting complaints, unfunded regulatory mandates, local flooding, financial pressures, loss of fish, beach closings, a roadway or bridge collapse, or law suits. The Town of Bristol community development and public works staff has identified the following:

- The Town has made significant progress in developing its stormwater management program and addressing stormwater related issues, but considerable work remains to be done to protect public health, preserve residents' quality of life, and ensure compliance with applicable state regulations
- A sustainable funding source is needed to:
    - Fully resolve drainage problems contributing to Sanitary Sewer Overflows

    - Address deficiencies in town's Phase II Stormwater Permit Program
    - Implement ongoing stormwater improvements to mitigate chronic flooding problems
    - Adopt an asset management approach for the town's stormwater infrastructure to better manage (maintenance and repair/replacement) the town's assets as many structures and systems reach the end of their useful life so as to prevent town's drainage infrastructure from deteriorating so far that huge financial problems are created
    - Upgrade older drainage structures that are now undersized as a result of development over time and to handle future "flood" flows (increase in 100yr storms)
    - Make structural improvements and operational enhancements to attenuate and treat runoff causing water quality problems in Kickemuit River and Mount Hope Bay, as required by TMDLs
    - Purchase new equipment to resolve inadequacy of existing equipment
    - Hire additional staffing to:
        - complete all necessary operation and maintenance functions, and
        - to review development projects and provide adequate oversight and inspection of construction sites to ensure proper construction of LID and infiltrating stormwater BMPs
- Current funding levels are insufficient to fully meet future stormwater management needs (detailed below). Underfunding of stormwater management program prevents town from having more pro-active and systematic approach to operation and maintenance of town drainage structures (including fully complying with Phase II permit requirements). Staffing constraints limit the town's ability to respond to water quality and/or flooding concerns in a timely manner.

Other compelling reasons for Bristol to consider setting up a dedicated revenue stream for managing stormwater include:

- Establishing a credit system as part of the stormwater utility would provide incentives to property owners to manage stormwater onsite, and reduce burden on town
- Establishing a dedicated revenue stream and creation of a stormwater enterprise fund would create certainty in planning structural improvements. It also allows the town to avoid finance charges by using "cash" to pay for certain capital improvements as well as to be eligible for grants, loans and other outside revenue sources that require revenue bonding authority or an enterprise fund
- An Enterprise fund holds the Town to a higher standard of use for that funding
    - Revenue generated by the utility has to be used for stormwater related costs and cannot be transferred for non-stormwater related uses
    - Ensures that resources are available to respond to problems as they arise
    - Bristol has a solid track record in managing its existing Sewer Enterprise Fund

4.0 Stormwater Program Cost of Service

This section provides an overview of the Town's current and estimated future stormwater program costs. Bristol finance, community development and public works program directors estimate the town currently spends a total of $1,520,000 annually on stormwater management. Of this, operation and maintenance expenses including labor, fuel, materials, and small repairs and upgrade projects account for $520,000 and larger capital improvement projects account for

roughly $1,000,000. Future program costs are estimated by the town's program directors to be a total of $2,220,500 with operation and maintenance accounting for $720,500 and larger capital improvement projects accounting for roughly $1,500,000 annually based on the drivers that are outlined in Section 3.1. This information is discussed in more detail below and serves as the basis for the funding evaluation in Section 5.0.

Creating a utility in Bristol would address both the immediate and long term funding concerns for the stormwater program. Stormwater maintenance costs are covered under the current funding methods, however, costs will only increase in the next few years with normal inflation, maintenance and replacement of aging drainage systems, expansion of services provided town-wide (e.g. site inspections) and new Phase II permit requirements. The designated funding collected via the utility would ensure that necessary maintenance, and replacement and construction projects are funded and completed as needed. The utility would also increase funding for the program and allow Bristol to repair aging/damaged infrastructure addressing water quality and flooding problems and construct stormwater improvements that are planned but currently lack funding.

4.1 Existing Stormwater Management Program Analysis

According to Town of Bristol staff, the current stormwater program in Bristol consists of the following key elements:

- Phase II stormwater program is administered town-wide and includes:
  - Public education about stormwater including work with RI NEMO, distributing brochures at town events, ads and articles in the local paper, etc.;
  - Inspection of catch basins, and cleaning as necessary;
  - Street sweeping town-wide including some state roads;
  - Review and approval of all development/redevelopment projects town-wide for consistency with soil erosion and sediment control ordinances and post construction stormwater requirements
  - Site inspections of construction sites and drainage control structures (best management practices)
  - Illicit discharge detection and elimination program including outfall inspections and monitoring
- Ongoing stormwater system improvements addressing areas subject to chronic flooding and to replace/upgrade aged and deteriorating infrastructure
- Ongoing town-wide repairs and improvements to drainage infrastructure and other repairs (including to roadways) related to damage caused by uncontrolled stormwater and erosion

Concerns with the current stormwater program include:

- Reduced DPW manpower (resulting from loss of 6 FTE over last 4 or 5 years) means the Town has not been able to complete all Phase II permit requirements known as six minimum measures. Areas of specific concern include:
  - Approximately 250 of 1800 catch basins are cleaned each year – that is less than 15% of all municipal catch basins
  - Outfall cleaning and maintenance is reactive as opposed to proactive

    - Outfalls are cleaned when they cause flooding or the town gets complaints
    - Still finding new outfalls
    - Second required dry weather survey was completed but significantly behind schedule
    - Need to do a better job tracking required performance measures.
- All stormwater ultimately drains to either Narragansett Bay, Bristol Harbor, Mt. Hope Bay or Kickemuit River
    - Untreated stormwater flows via outfalls or as sheet flow at the end of streets into waterbodies creating visible piles of sand and debris;
    - Broken corrugated pipe evident along shoreline(s)
- There is no preventive or scheduled maintenance, projects are predominantly reactionary
- Because of the interconnection between stormwater and wastewater in resolving the town's sanitary sewer overflow issues, sewer enterprise funds have been utilized to address inter-related stormwater issues. Two separate programs are needed to adequately fund both.
- Work with the town drainage committee tends to focus on residential flooding problems (water in basements or streets/yards) and not necessarily focusing on "big picture" problems facing the town

The costs of the current stormwater program were compiled and grouped into major categories, as presented in Table 4-1 below.

Table 4-1. Existing Stormwater Program Cost of Service

Description	*Cost*
Minimum Control Measure #1: Public Education & Outreach	$1,000
Minimum Control Measure #2: Public Involvement/Participation	$500
Minimum Control Measure #3: Illicit Discharge Detection & Elimination	$11,000
Minimum Control Measure #4: Construction Site Stormwater Runoff Control	$15,000
Minimum Control Measure #5: Post Construction Site Stormwater Management	$1,000
Minimum Control Measure #6: Pollution Prevention & Good Housekeeping	$221,500
TMDL Program	$5,000
Stormwater General Operations & Maintenance	$6,000
GIS Program	$23,000
MS4 Annual Report	$1,500
Stormwater Vehicles & Equipment Maintenance, fuel & lease costs	$33,500
Administrative Other Non-specific	$30,000
Contracted Services (including additional engineering support)	$145,000
Materials	$26,000
Large Scale Drainage Projects – completed and ongoing	$1,000,000
Total	**$1,520,000**

4.2 Future Stormwater Program Analysis

The future stormwater program will include the projects outlined in section 3.1 as well as increased maintenance and repair costs as a result of aging infrastructure, and other capital improvement projects related to implementing Phase II TMDL requirements to improve the water quality of Kickemuit River and Mt. Hope Bay. The cost estimate for the future stormwater program is outlined in Table 4-2 below.

Table 4-2. Future Stormwater Program Cost of Service

Description	*Cost*
Minimum Control Measure #1: Public Education & Outreach	$4,000
Minimum Control Measure #2: Public Involvement/Participation	$2,000
Minimum Control Measure #3: Illicit Discharge Detection & Elimination	$20,000
Minimum Control Measure #4: Construction Site Stormwater Runoff Control	$25,000
Minimum Control Measure #5: Post Construction Site Stormwater Management	$10,000
Minimum Control Measure #6: Pollution Prevention & Good Housekeeping	$300,000
TMDL Program	$20,000
Stormwater General Operations & Maintenance	$10,000
GIS Program	$38,000
MS4 Annual Report	$1,500
Stormwater Vehicles & Equipment Maintenance, fuel & lease costs	$50,000
Administrative Other Non-specific	$35,000
Contracted Services (including additional engineering support)	$175,000
Materials	$30,000
Large Scale Drainage Projects – completed and ongoing	$1,500,000
Total	**$2,220,500**

5.0 Funding Evaluation

This section evaluates the potential to fund Bristol's stormwater program through a stormwater utility. General information related to stormwater utility financing is provided below, followed by the funding evaluation that was conducted for Bristol.

5.1 Rate Structure Evaluation

The stormwater system is a public system that carries runoff from both public and private properties – everyone pays because everyone contributes to runoff. The framework that describes how much each property pays is called the "rate structure."

The rate structure developed for a particular utility is divided into three modules:

1) The basic rate methodology;
2) Modification factors, which can be applied to any of the rate concepts to enhance equity, reduce costs, increase simplicity, and meet other objectives; and
3) Secondary funding methods that can be adopted in concert with the service charges to enhance equity or increase revenue

We will not be fully defining modification factors or discussing secondary funding methods at this point; however, if the Town wishes to pursue implementation, these subjects will be important to address. The basic rate methodology needs to be defined on a preliminary basis in order to make fee estimates, as outlined below.

5.1.1 Basic Rate Methodology

The basic rate methodology defines what makes up the rate that users will be paying. The fee structure of a stormwater utility should be dictated by the needs of the municipality. Since the

needs of every municipality are unique, fees systems vary among utilities as well as year-to-year within the same utility as a result of maintenance and personnel costs, capital improvement projects, project cost repayment, etc. By reviewing past stormwater related budgets and costs, expected budget costs, outstanding debt from completed projects, expected costs of planned capital improvement projects and necessary revenue for a successful stormwater management program, municipalities can estimate a dollar amount for the total revenue that the utility will help finance.

The three main impacts of urban development are increases in peak flow, volume of discharge, and amount of pollution; all other impacts can fit into these three basic categories. When we look at each of these major impacts in an urban setting, the primary cause is the conversion of forests and fields to impervious area (e.g., pavement, roof tops, etc.). It is this conversion to impervious area that causes a town to invest in the public drainage system – and the costs are roughly proportional.

Therefore, nearly all stormwater utilities use some surrogate of impervious area in their rate methodologies. A 2010 survey found that 55 percent of all stormwater utilities responding used impervious area as the only factor that went into the rate calculation, and 94 percent included some measure of impervious area in their calculation (Black &Veatch, 2010).

However, there are other factors or ways to configure the rate methodology to emphasize specific impacts or encourage certain kinds of development. Many of these considerations are handled with a stormwater crediting or secondary funding system. Some factors can best be handled in the makeup of the basic rate methodology itself.

5.1.2 **Data and Equivalent Residential Unit (ERU) Analysis**

The typical form of data analysis that is required to establish a stormwater utility is an assessment of impervious cover per parcel within the Stormwater Utility District (SUD). An Equivalent Residential Unit (ERU), also sometimes called an Impervious Surface Unit (ISU), is calculated specifically for each SUD and represents the amount of impervious cover in a typical residential parcel. The ERU is then used as the billing unit for the SUD. This is an intuitively understood concept acceptable to most ratepayers. Thus, if a property has ten times the ERU measurement (e.g. ten times more impervious cover than the typical residential property), they would pay ten times the fee charged a typical residential property. The data analysis and ERU calculation are discussed below.

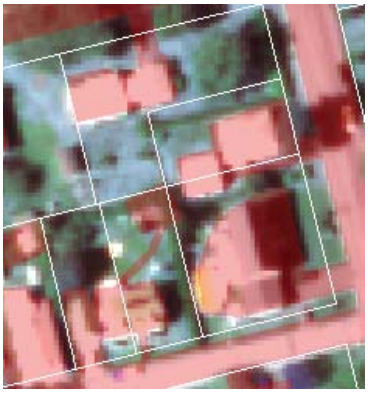
Data Analysis

An accurate analysis of impervious cover and a well structured GIS are essential to developing a rational and legal fee structure. Data needed for this analysis include: current aerial photographs; high-resolution satellite data or an impervious cover map; and digital parcel data from the Tax Assessor's office. The images used for the analysis should ideally be taken within the last few years to capture any recent changes in development or land cover type (e.g. creation of impervious cover). The resolution of the images is also important; lower resolution images are not only difficult to interpret visually, but have excessively large pixel sizes for classification (4 m resolution or better is ideal).

The data analysis performed for this study used ENVI (satellite and aerial photography analysis software that identifies impervious surfaces by the distinct reflective qualities of various materials) and ArcMap to produce a 2010 impervious cover layer for Bristol. The existing statewide impervious cover layer was created with data collected in 2003. A noticeable amount of development and deconstruction has taken place in Bristol since that time. The 2003 Impervious Cover layer was used as a base layer and change since 2003 was assessed by performing a classification in ENVI on 2010 aerial photographs. Change was digitized in ArcMap and parcel data from Bristol's Tax Assessor was overlaid to calculate square footage of impervious cover within each parcel.

Data Analysis Procedure:

1. Use ENVI to Perform a Classification
2. Upload the ENVI Output into ArcMap and Convert the output to a Raster
3. Digitize Areas of New Impervious and New Pervious Cover
4. Convert New Feature Classes to Rasters and Add/Subtract them to/from the 2003 Impervious Cover Layer
5. Calculate the Amount of Impervious Cover in Each Parcel
6. Sort Parcels by Residential and Non-Residential
7. Calculate Equivalent Residential Unit (ERU)



Impervious cover maps for Bristol can be found in Appendix C.

Equivalent Residential Unit (ERU) Analysis

The two most common methods for calculating the ERU are: manually calculate the mean of a sample set of residential parcels (e.g., 100 single family residences) or calculate the median for all residential parcels in the database. The method chosen should be influenced by the quality of impervious cover data for residential parcels. Since Bristol's GIS data for impervious cover is reasonably accurate, it is appropriate to use the median for the entire database.

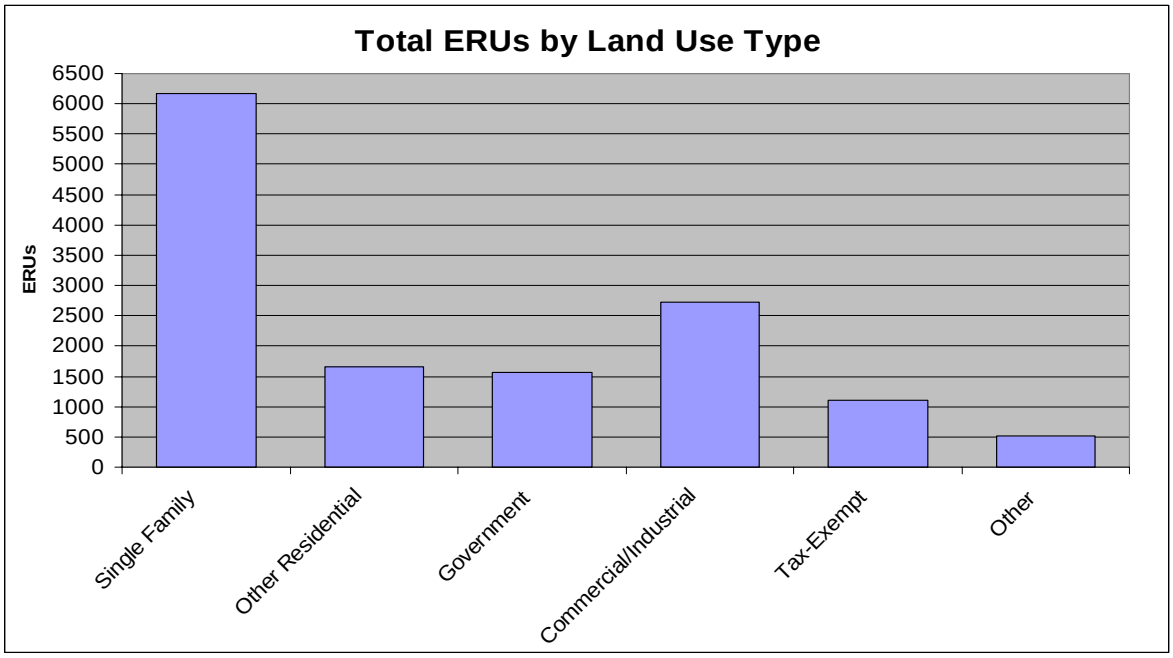
To calculate the ERU, parcels were classified as "residential," "non-residential," or "non-billable." Non-billable parcels are either a non-parcel (such as a street right of way) or exempted parcels (such as the state owned land or parcels that reside either partially or entirely outside the town boundaries). The following ERU analysis assumes that the utility will be town-wide and exclude state owned properties.

- ERU – 3,391 sq ft: represents the median amount of impervious cover in single family residential properties only.

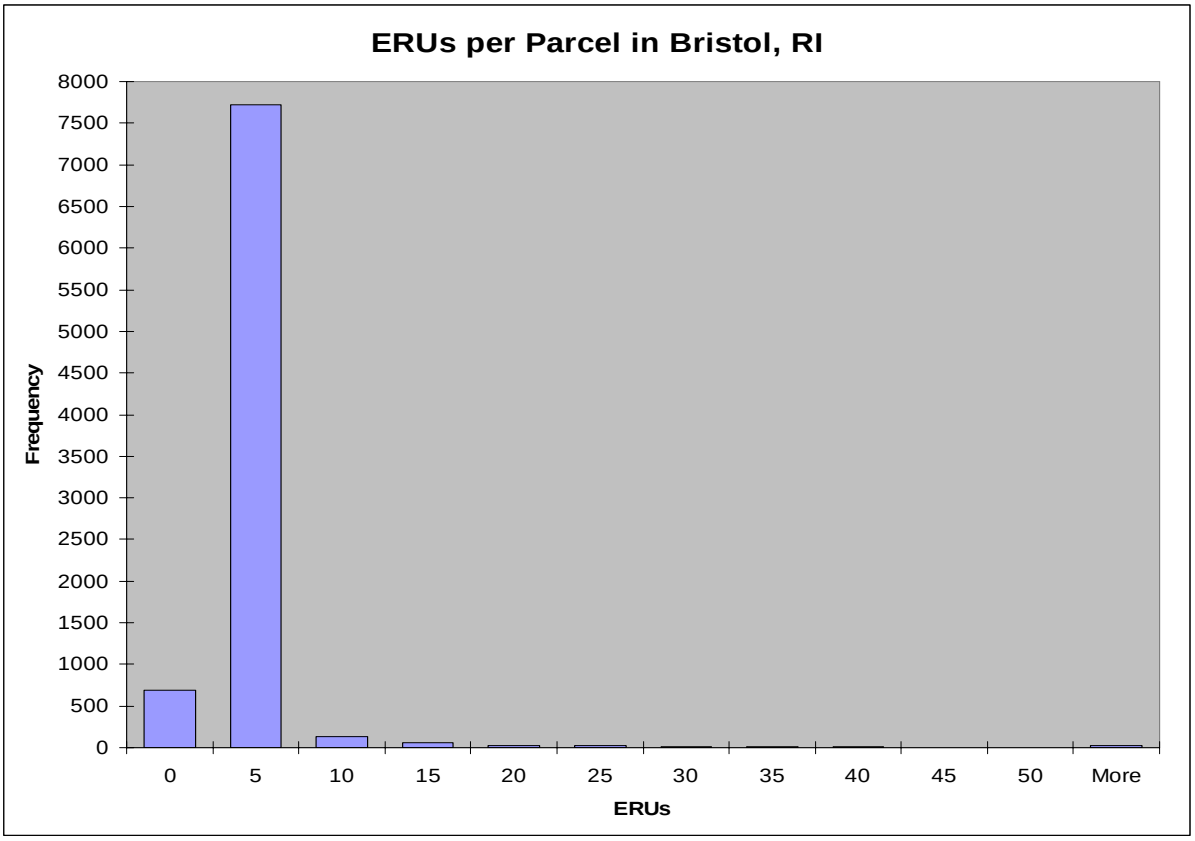
The total ERUs calculated for major property types in town are outlined below in Table 5.1.

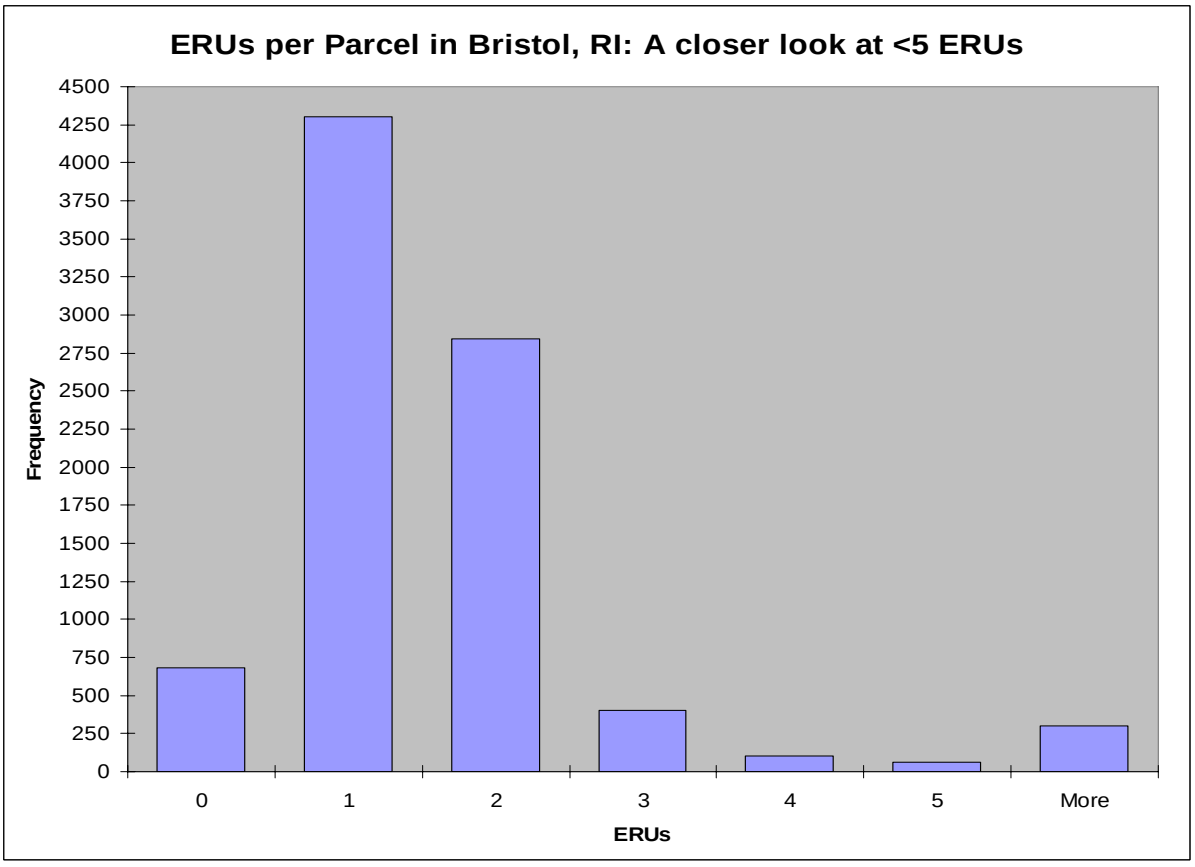
Table 5.1: Total ERUs by Major Property Type

Single Family	Other Residential	Non-Residential	TOTAL ERUs
6,164	1,657	5,944	13,765



ERU: 3,391 sqft | Average Residential: 1 ERU | Average "Other": 5.3 ERUs


ERUs per Parcel in Bristol, RI
Frequency
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0
5
10
15
20
25
30
35
40
45
50
More
ERUs


ERUs per Parcel in Bristol, RI: A closer look at <5 ERUs
Frequency
4500
4250
4000
3750
3500
3250
3000
2750
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
0
1
2
3
4
5
More
ERUs

A CD containing total square footage of impervious cover and ERU data for all parcels in Bristol has been attached to this report.

5.2 Revenue Potential & Fees

It is essential to the success of the utility that the rate structure be established to fit the financial and political needs of the municipality. Rate structures should be fair and justifiable while still bringing in enough revenue to adequately fund the stormwater program. A well funded and functioning stormwater program is justification for the utility in and of itself. Rate structures directly impact the amount of revenue generated by the utility. Whether the utility charges everyone the same or charges properties with large plats of impervious cover higher fees, the structure chosen is one of the most important decisions made by the municipality during the time leading up to the authoring of the stormwater utility ordinance. Examples of various types of rate structures can be found in Appendix D.

5.2.1 Rate Structure for Consideration in Bristol

A flat rate structure known as an Equitable System was chosen to illustrate a sample rate structure that Bristol might consider for their stormwater utility. This example assumes that the utility is town-wide and excludes state owned properties. An equitable fee system assesses the same fee per ERU to every property, residential or otherwise, in the municipality. The total fee is calculated by multiplying the number of ERUs within a parcel by the monthly rate for the utility. Meaning, if a residential parcel contains .7 ERUs of impervious cover, the monthly rate per ERU is multiplied by .7 to determine the total fee for that parcel. If an "other" parcel contains 15 ERUs of impervious cover, the monthly rate is multiplied by 15 to determine the total fee for that parcel.

ERU: 3,391 sqft (Median of single family only)

Total desired revenue for stormwater program	*$1,500,000*
Sum of ERUs within the utility	13,765
SUD fee	**$108.97/yr/ERU or $9.08/mo/ERU**
Total revenue	*$1,499,972.05*

The table above outlines the fee structure for desired revenue of $1,500,000 (current level of spending on stormwater management). Based upon this simple stormwater utility rate structure example, in a system with desired revenue of $1,500,000, a typical single-family homeowner would pay $108.97/yr or $9.08/mo. A typical "other" property owner would pay $577.54/yr or $48.13/mo.

ERU: 3,391 sqft (Median of single family only)

Total desired revenue for stormwater program	*$2,200,000*
Sum of ERUs within the utility	13,765
SUD fee	**$160.88/yr/ERU or $13.41/mo/ERU**
Total revenue	*$2,200,034.00*

The table above outlines the fee structure for a desired revenue of $2,200,000 (the estimated level of funding needed to meet the town's stormwater management goals). Based upon this simple stormwater utility rate structure example, in a system with desired revenue of $2,200,000,

a typical single-family homeowner would pay $160.88/yr or $13.41/mo. A typical "other" property owner would pay $852.66/yr or $71.06/mo.

6.0 Credit System

Once the rate structure has been chosen, the municipality can begin considerations for the credit system for the utility. Credit systems are becoming increasingly important in stormwater utilities because they create incentives for property owners to reduce the amount or improve the quality of stormwater generated on their property. It is not enough to just provide funding for the stormwater program, property owners need to help manage stormwater at the point it is generated - meaning that stormwater is treated on-site. For example, roof runoff can be directed to a dry well on the property, and depending on the size, parking lot runoff can also be "disconnected" by draining to a lawn area, rain garden or other on-site infiltration or treatment system. Improvements made by property owners reduce the volume of runoff that must be managed by the town and thus reduce the town's overall stormwater program costs.

7.0 Conclusion and Recommended Next Steps

This study was intended to evaluate a sustainable funding approach for Bristol's stormwater management program for further review and consideration by the Town. The recommended next steps are to continue evaluating the concept of a stormwater utility for the Town of Bristol and are outlined below:

- Present the study results to the Town Council for review and discussion with a recommendation for further investigation into stormwater utility as a potential funding mechanism
- Create a stakeholder group to guide the next steps and gain public input and build community support as the Town continues to evaluate the stormwater utility and/or begin implementation including consideration of creating a joint sanitary and storm sewer enterprise fund
- Develop a road map for the project to address the key utility implementation steps outlined below:
    - Public Outreach/Education and Stakeholder Involvement
    - Detailed Cost of Service Analysis
    - Detailed Financial/Funding Analysis
    - Credit Analysis
    - Detailed Rate Structure Analysis
    - Budget and Cash Flow Rate Model
    - Organization/Governance
    - Billing Options & Master Account File
    - Rate Ordinance Development
    - Billing Testing & Support

Appendix A: Definitions

Best Management Practices (BMP) – Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of and impacts upon waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Catch Basin – A structure containing a sump placed below grade to conduct water from a street or other paved surface to the storm sewer.

Clean Water Act refers to the Federal Water Pollution Control Act (33 U.S.C. § 1251) et seq. and all amendments thereto.

Equivalent Residential Unit (ERU) – Represents the average amount of impervious cover in residential parcels within a utility.

Impervious Cover – Refers to any surface type that does not allow water to pass through it (i.e. pavement, concrete, rooftops, etc.).

Low Impact Development – A site planning and design strategy intended to maintain or replicate predevelopment hydrology through the use of site planning, source control, and small-scale practices integrated throughout the site to prevent, infiltrate and manage runoff as close to its source as possible.

Municipal Separate Storm Sewer System (MS4) – A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) owned or operated by a State, city, town, or other public body (created by or pursuant to State law).including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, that is designed or used for collecting or conveying stormwater.

Phase II Stormwater Permit Program – The Rhode Island Pollution Discharge Elimination System (RIPDES) regulations (enacted February 2003) require operators of small MS4 to apply for a RIPDES permit. The RIPDES application must include a Storm Water Management Program Plan (SWMPP) that describes the Best Management Practices (BMPs) for each of the following six minimum measures:

1. Public Education and Outreach
2. Public Involvement/Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff Control
5. Post Construction Runoff Control
6. Pollution Prevention/Good Housekeeping

Pollutants – Any dredged material, solid waste, incinerator residue, sewage, garbage, sewage sludge, sediment, filter backwash, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, industrial or municipal or agricultural waste or effluent, petroleum or petroleum products, including but not limited to oil; or any material which will likely alter the physical, chemical, biological or radiological characteristics and/or integrity of water.

Rhode Island Pollutant Discharge Elimination System (RIPDES) – The Rhode Island system for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing point source discharge permits pursuant to Title 46, Chapter 12 of the General Laws of Rhode Island and the federal Clean Water Act.

Runoff – The flow on the surface of the ground, resulting from precipitation and snowmelt that does not infiltrate into the soil.

Stormwater – Precipitation and snow melt induced runoff, including material dissolved or suspended in it.

Stormwater Management Program Plan (SWMPP) – Part of the RIPDES stormwater permit that requires the development of six minimum control measures and incorporation of TMDL requirements, that when properly implemented will reduce pollutants to the maximum extent practicable. Additionally, annual reports must be prepared and submitted for approval.

Stormwater Retrofits – Modifications to existing development to incorporate source controls and structural stormwater treatment practices to remedy problems associated with and improve water quality mitigation functions of older, poorly designed, or poorly maintained stormwater drainage systems.

Total Maximum Daily Load (TMDL) – A calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources, including a margin of safety. In Rhode Island TMDL studies are prepared by DEM and include a description of the necessary pollution control actions to support restoration of the waterbody’s designated uses. These water quality restoration plans are in essence a prescription for the waterbody’s return to a safe and healthy aquatic ecosystem.

Appendix B: Rhode Island Enabling Legislation

Rhode Island General Law
TITLE 45
Towns and cities
CHAPTER 45-61
Stormwater Management Districts

45-61-1. Short title. -- This chapter shall be known and may be cited as the "Rhode Island Stormwater Management and Utility District Act of 2002."

45-61-2. Legislative findings. -- The general assembly hereby recognizes and declares that: The general assembly finds that stormwater, when not properly controlled and treated, causes pollution of the waters of the state, threatens public health, and damages property. Stormwater carries pollutants and other material from the land - such as human and animal waste, oil, gasoline, grease, fertilizers, nutrients, and sediments - into rivers, streams, ponds, coves, drinking water aquifers, and Narragansett Bay. Stormwater reaches the state's waters by streets, roads, lawns, and other means. As a result, public use of the natural resources of state for drinking water, swimming, fishing, shellfishing, and other forms of recreation is limited and in some cases prohibited.

The general assembly further finds that inattention to stormwater management results in erosion of soils and destruction of both public and private property, thereby putting public safety at risk and harming property values and uses, including agriculture and industry. Therefore, to help alleviate existing and future degradation of the state's waters and the associated risks to public health and safety, and to comply with state and federal stormwater management requirements, stormwater conveyance systems must be maintained and improved. The state of Rhode Island is delegated by the United States Environmental Protection Agency to implement "Phase II" stormwater management regulations, which require municipalities and other persons to increase their capacity to control stormwater. The Department of Environmental Management's Pollution Discharge Elimination System program has promulgated these regulations.

45-61-3. Declaration of purpose. -- The purpose of this chapter is to authorize the cities and towns of the state to adopt ordinances creating stormwater management districts (SMD), the boundaries of which may include all or part of a city or town, as specified by such ordinance. Such ordinances shall be designated to eliminate and prevent the contamination of the state's waters and to operate and maintain existing stormwater conveyance systems.

45-61-4. Powers of councils. -- The city or town council of any city or town in the state, by itself or with other cities and towns, pursuant to chapter 45-43, and in accordance with the purposes of this chapter, are hereby authorized to adopt ordinances creating stormwater management districts, which will be empowered, pursuant to such ordinance, to:

(1) establish a fee system and raise funds for administration and operation of the district. The fee system shall be reasonable and equitable so that each contributor of runoff to the system shall pay to the extent to which runoff is contributed; and the state shall be exempted from the fee

system. However, the state Department of Transportation shall cooperate with the municipalities in the planning and implementation of wastewater management ordinances, including the providing of funds, if available, to match the fees collected by the municipalities annually.

(2) prepare long range stormwater management master plans;

(3) implement a stormwater management district in accordance with regulations and model ordinances promulgated under this chapter;

(4) retrofit existing structures to improve water quality or alleviate downstream flooding or erosion;

(5) properly maintain existing structures within the district;

(6) borrow for capital improvement projects by issuing bonds or notes of the city or town;

(7) hire personnel to carry out the functions of the districts;

(8) receive grants, loans or funding from state and federal water quality programs;

(9) grant credits to property owners who maintain retention and detention basins or other filtration structures on their property;

(10) make grants for implementation of stormwater management district plans;

(11) purchase, acquire, sell, transfer, or lease real or personal property;

(12) impose liens;

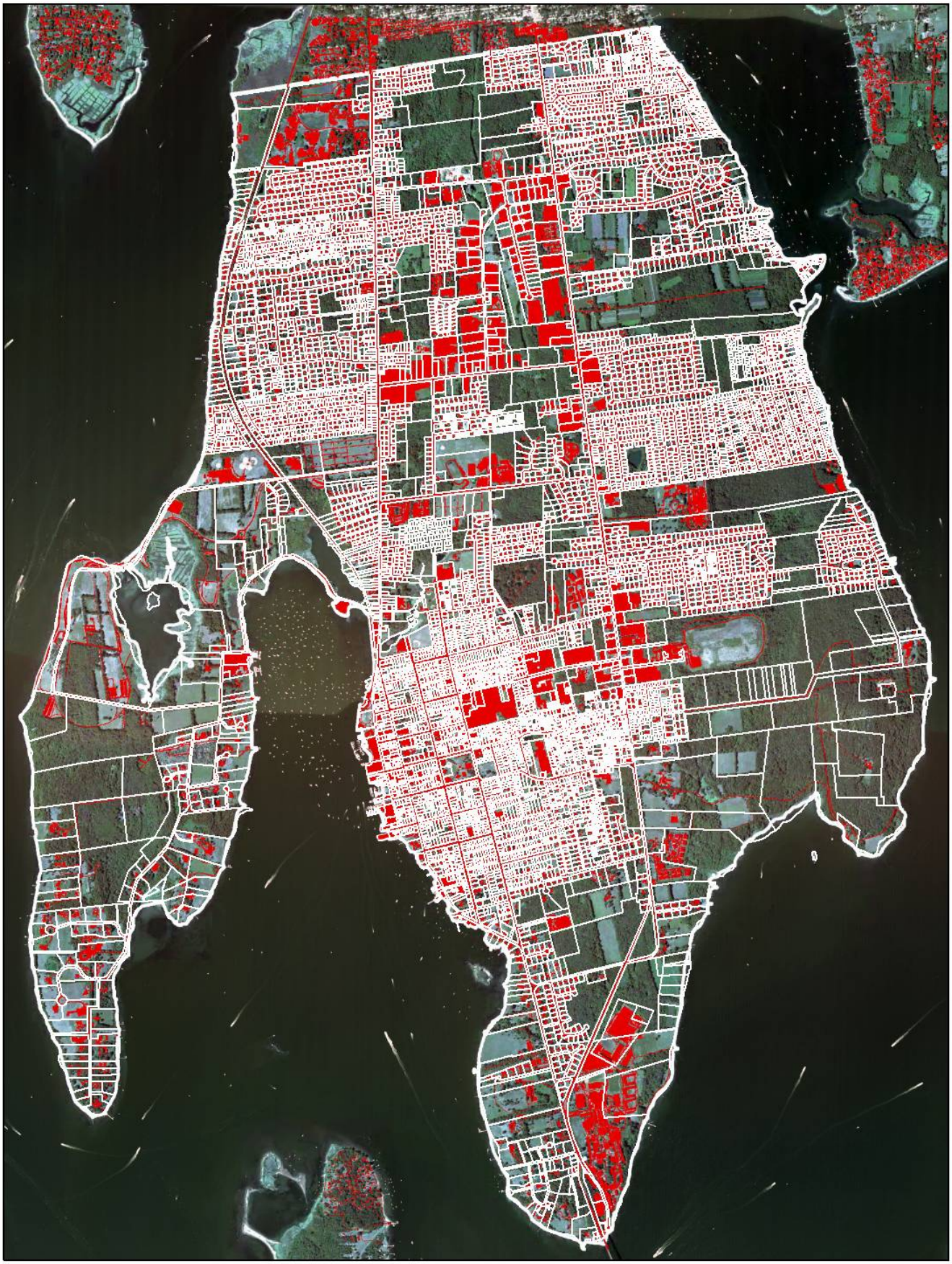
(13) levy fines and sanctions for noncompliance;

(14) provide for an appeals process;

(15) contract for services in order to carry out the function of the district.

SECTION 2. This act shall take effect upon passage.

Appendix C: Impervious Cover Maps



Bristol Impervious Cover Zoom

Appendix D: Example Rate Structures

Rate structures can be constructed in several ways; examples are provided below using a hypothetical desired revenue of $ 1 million. The first is by using an Equivalent Residential Unit (ERU) with an associated fee. After calculating an ERU for a municipality to equal 2,500 sq ft, determine the sum of ERUs in the municipality. Small Residential properties (single family/duplex) are equivalent to 1 ERU and Large Residential properties (triplex) are equivalent to 2 ERU, regardless of the amount of impervious cover they contain. Once you have determined the total number of ERUs in the municipality, divide the total desired revenue for the stormwater program by the total ERUs in the municipality to find your fee per ERU.

Standard Equivalent Runoff Unit fee system:

Area of Equivalent Residential Unit (ERU)	2,500 sq ft
Total desired revenue for stormwater program	*$1,000,000.00*
Sum of ERUs within the utility	310,000 ERUs
Small Residential (single family/duplex: 1 ERU)	$3.23/mo
Large Residential (triplex: 2 ERU)	$6.46/mo
Other Properties (per ERU)	$3.23/mo/ERU
Total revenue	*$1,000,000.00*

A commonly used variation of this system is to determine an ERU for residential properties and calculate a separate ERU for all non-residential properties. This type of rate structure is ideal for municipalities that would like to shift the burden of paying for the stormwater program from residents to property owners creating higher volumes and more impaired stormwater on their property as a result of large areas of connected impervious cover.

Variation Equivalent Residential Unit fee system:

Area of Residential Equivalent Residential Unit (ERU)	2,500 sq ft
Total desired revenue for stormwater program	*$1,000,000.00*
Number of residential parcels within the utility	150,000
Sum of residential ERUs within the utility	220,000 (80,000 Sm | 70,000 Lg)
Small Residential (single family/duplex: 1 ERU)	$3.23/mo
Large Residential (triplex: 2 ERUs)	$6.46/mo
Total revenue from residential parcels	*$710,600.00*
Area of Non-residential Equivalent Residential Unit (ERU)	1,000 sq ft
Remaining desired revenue	*$289,400.00*
Number of non-residential parcels within the utility	9,000
Sum of non-residential ERUs within the utility	90,000
Other Properties (per ERU)	$3.23/mo/ERU
Total revenue from non-residential parcels	*$290,700.00*

Another possible fee structure is to create a stratified system in which total area of impervious cover for all non-residential parcels are sorted in ascending order and tiers are assigned based on the distribution of the data. Residential parcels are typically still subject to a flat rate determined

by an ERU as described in the previous two rate structures. This is another fee system that shifts the financial burden from residents to property owners with larger areas of impervious cover.

Stratified fee system:

Area of Equivalent Residential Unit (ERU)	2,500 sq ft
Small Residential (single family/duplex: 1 ERU)	$2.50/mo
Large Residential (triplex: 2 ERUs)	$5.00/mo
Other Properties (Tier 1 – 2,500 – 12,500 sq ft)	$500/mo
Other Properties (Tier 2 – 12,501 – 30,500 sq ft)	$1,000/mo
Other Properties (Tier 3 – 30,501 – 50,500 sq ft)	$1,500/mo
Other Properties (Tier 4 – 50,501+ sq ft)	$2,000/mo

There are also proportional systems, in which the residential parcels are charged a flat fee based on an ERU as in the aforementioned systems. However, the fees for all other property types are comprised of the product of multiplying the total impervious cover in the parcel by a fee per square footage OR the fees for all other parcel types are comprised of the flat fee AND the product of multiplying total impervious cover in excess of the ERU by an additional fee per square footage. Proportional fee system #1 has a flat rate for Small Residential (single family/duplex) and Large Residential (triplex) and all other properties are charged a fee per square foot of impervious cover. Proportional fee system #2 has a flat rate for Small Residential (single family/duplex) and Large Residential (triplex) and all other properties are charged a flat rate for the first 2,500 sqft of impervious cover in the parcel and are charged a fee per square foot for of impervious cover in excess of 2,500 sqft.

Proportional fee system #1:

Area of Equivalent Residential Unit (ERU)	2,500 sq ft
Total desired revenue for stormwater program	*$1,000,000.00*
Number of residential parcels within the utility	150,000
Sum of residential ERUs within the utility	220,000 (80,000 Sm | 70,000 Lg)
Small Residential (single family/duplex: 1 ERU)	$2.50/mo
Large Residential (triplex: 2 ERUs)	$5.00/mo
Total revenue from residential parcels	*$550,000.00*
Remaining desired revenue	*$450,000.00*
Fee per sqft of impervious cover	$.0016
Sum of IC in other properties within the utility	292,500,000 sqft
Total revenue from other properties	*$468,000.00*

Proportional fee system #2:

Area of Equivalent Residential Unit (ERU)	2,500 sq ft
Total desired revenue for stormwater program	*$1,000,000.00*
Number of residential parcels within the utility	150,000
Sum of residential ERUs within the utility	220,000 (80,000 Sm | 70,000 Lg)
Small Residential (single family/duplex: 1 ERU)	$2.50/mo

Large Residential (triplex: 2 ERUs)	$5.00/mo
Total revenue from residential parcels	*$550,000.00*
Remaining desired revenue	*$450,000.00*
Other Properties: flat rate + product of $.0034 x sqft of impervious cover in excess of 2,500 sqft	$2.50 + ($.0034 x sqft >2,500 sqft)
Revenue from flat rate x number of other parcels	$225,000.00
Sum of IC >2,500sqft in other properties within the utility	67,500,000 sqft
Total revenue from other properties	*$454,500.00*

Finally, there are purely proportional fee systems in which each square foot of impervious cover is multiplied by a fee per square footage. However, these systems require a lot of initial work to create, as well as constant adjustment as there is development and deconstruction within the municipality. It can be said that proportional systems are the most equitable, but as it is a primary purpose of an SUD to encourage property owners to disconnect contiguous impervious surfaces and allow for natural hydraulic processes and infiltration to occur, it is often beneficial to disproportionately charge properties with larger swaths of impervious cover to motivate a change in behavior.

Pure Proportional fee system:

Total desired revenue for stormwater program	*$1,000,000.00*
Sum of sqft of impervious cover within the utility	842,500,000
All Properties	$.0012 x sqft IC
Total revenue	*$1,011,000.00*